

## Claims

- [c1] What is claimed is:
- 1.A light emitting diode comprising:
- an insulating substrate;
- a semiconductor multilayer positioned on the insulating substrate, the semiconductor multilayer comprising a first surface and a second surface, a distance between the first surface and the insulating substrate is greater than a distance between the second surface and the insulating substrate;
- a first transparent ohmic contact electrode positioned on the first surface; and
- a second transparent ohmic contact electrode positioned on the second surface;
- wherein the first transparent ohmic contact electrode and the second transparent ohmic contact electrode comprise the same materials.
- [c2] 2.The light emitting diode of claim 1 wherein the insulating substrate comprises sapphire.
- [c3] 3.The light emitting diode of claim 1 wherein the first transparent ohmic contact electrode and the second transparent ohmic contact electrode are made of at least one selected from a group comprising indium tin oxide (ITO), cadmium tin oxide (CTO), and titanium-tungsten nitride (TiWN).
- [c4] 4.A light emitting diode comprising an insulating substrate, an  $n^-$  or  $n^+$  -type contact layer of gallium nitride (GaN)-based compounds positioned on the insulating substrate, and a transparent ohmic contact electrode positioned on the contact layer, the transparent ohmic contact electrode being made of at least one selected from a group comprising indium tin oxide, cadmium tin oxide, and titanium-tungsten nitride.
- [c5] 5.A light emitting diode comprising:
- an insulating substrate;
- a buffer layer positioned on the insulating substrate;
- an  $n^+$  -type contact layer positioned on the buffer layer, the contact layer comprising a first surface and a second surface;
- an  $n^-$ -type cladding layer positioned on the first surface of the  $n^+$  -type contact layer;

a light-emitting layer positioned on the n-type cladding layer;  
a p-type cladding layer positioned on the light-emitting layer;  
a p-type contact layer positioned on the p-type cladding layer;  
an  $n^{+}$ -type reverse-tunneling layer positioned on the p-type contact layer;  
a p-type transparent ohmic contact electrode positioned on the  $n^{+}$ -type reverse-tunneling layer; and  
an n-type transparent ohmic contact electrode positioned on the second surface of the  $n^{+}$ -type contact layer;  
wherein the p-type transparent ohmic contact electrode and the n-type transparent ohmic contact electrode comprise the same materials.

[c6] 6.The light emitting diode of claim 5 wherein the insulating substrate comprises sapphire.

[c7] 7.The light emitting diode of claim 5 wherein the p-type transparent ohmic contact electrode and the n-type transparent ohmic contact electrode are made of at least one selected from a group comprising indium tin oxide, cadmium tin oxide, and titanium-tungsten nitride.